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ABSTRACT

Language samples of 15 young normal children actively engaged in learning base syntax were compared with samples of 15 linguistically deviant children of a comparable linguistic level. Mean number of morphemes per utterance was used to determine linguistic level. The two groups were matched according to five linguistic levels previously established and grammars were written for the language sample of each child. Five aspects of syntactic development were chosen as the basis of comparison between the two groups: phrase structure rules, transformations, construction (or sentence) types, inflectional morphology, and minor lexical categories. While few significant differences were found for the more general aspects of syntax, such as phrase structure rules, frequently occurring transformations, inflectional morphology, and the development of minor lexical categories, significant differences were found for the less general aspects of syntax. For example, significant differences were found between the two groups for infrequently occurring transformations and the number of major syntactic categories per construction type. In addition, the deviant group also showed a marked delay in the onset and acquisition time for learning base syntax. These results are discussed according to translational and cognitive developmental theory. (Author/JSHR)

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THE DEVELOPMENT OF BASE SYNTAX IN NORMAL AND LINGUISTICALLY DEVIANT CHILDREN

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INTRODUCTION

1.0 Recent evidence suggests that early stages in first language acquisition are difficult to impede, save extensive brain dysfunction. Even with serious brain dysfunction, the prognosis for acquiring a base linguistic system is good due to the plasticity of the developing brain (Lenneberg, 1966). Despite this apparent strong biological component for language development, some children - including those without any detectable brain dysfunction - experience extreme difficulty in acquiring language. Children with language learning deficits are generally able to demonstrate a linguistic system which is, in certain significant aspects, quite different from that of the normal child. Recently, this "qualitative" difference has become the central focus for studying linguistically deviant children (Menyuk, 1964; Lee, 1966).

Menyuk's (1964) early work represents the first systematic attempt to compare normal and deviant children using descriptive techniques based on Chomsky's early transformational grammar. She matched both groups according to the criteria of age, IQ, and socio-economic level and found that the utterances sampled from linguistically deviant children were qualitatively different from those of normal children. The deviant group used fewer transformations and produced more restricted or ungrammatical forms than did the normal group. More forms were also omitted by the deviant group in constructions representing the phrase structure, transformational and morphological levels of the grammar. Since few statistically significant differences were found, these results were projected to indicate possible trends of differences between normal and deviant children. Menyuk (1964) did include a comparison between a normal two-year-old and a deviant three-year-old child. The dissimilarities were again found to be more predominant than the similarities. Unfortunately, only two subjects were compared and they were not matched on any specific criteria.

Lee (1966) has developed four levels of developmental sentence types for comparing syntactic development in normal and deviant children. In constructing the sentence types which postulate different linguistic levels, she followed closely the review of early work in syntactic development by McNeill (1966). As a pilot test of the utility of the sentence types and linguistic levels, a language sample of a normal three-year-old was compared with that of a deviant four-and-one-half-year-old. The normal child's utterances more closely approximated the sentence types at all four levels than did the utterances of the deviant child. The deviant child also omitted constructions that were not omitted by the normal child. From these findings, Lee concluded that there were qualitative differences between the two children.

The research involving rule-based behavior indicates that all level or stage changes appear to be qualitative (Piaget, 1970; Kohlberg, 19--). Therefore, unless subjects are matched according to criteria which reflect a specific level or stage of development, qualitative differences can be predicted on the basis that each level or stage of development is radically different from the preceding or following stage of development. Moreover, recent work in language acquisition

suggests that finding qualitative differences may not be unique to deviant and normal subjects but may reflect linguistic level differences indicating individual differences in cognitive function and linguistic experience (Bloom, 1970; Brown, Cazden, and Bellugi, 1968).

More recently, Carrow (1968) and Lee (1970) have reported preliminary development of syntactic testing procedures using the experimental methods of Crazer, Brown and Bellugi (1963). Carrow's testing procedures are confined to comprehension tasks while Lee has included both comprehension and production tasks. Both tests were developed to assess certain aspects of syntactic development between three and eight years of age. Application of diagnostic tests based on higher age level performance presents serious problems since aside from Carol Chomsky's (1969) recent research, little work has been done with normal children over four years of age.

In the research that has been carried out with children younger than four years of age, syntax has received by far the greatest attention. It appears that the most active period for learning base syntax is between eighteen months and four years. Thus, it is of considerable heuristic value to compare linguistically deviant children with normal children actively engaged in acquiring syntax. In addition, recent methods for writing children's grammars vary considerably from the early notions of "pivot" grammars which do not include the important distinction between deep (semantic) and surface (phonetic) structure (Bloom, 1970; Brown, 1970). Moreover, if deep and surface structure relations are to be adequately described, it is necessary to collect contextual information for each utterance in a language sample. For example, noun + noun constructions, such as Daddy bike, may require two or more deep or semantic interpretations to separate the possessive form from such forms as the subject-object. Grammar writing for young children now includes analysis of both aspects of grammatical relations (Bloom, 1970; Brown, 1970).

The purpose of the present study was to compare language samples which include contextual information of young normal children (18 to 36 months of age) actively engaged in learning syntax with those of deviant children of a comparable linguistic level. Linguistic level was determined by a mean number of morphemes per utterance, which appears to be a reliable measure for normal children up to three years of age (Menyuk, 1969; Bloom, 1970; Brown, 1970). An attempt was also made to establish mean morpheme per utterance count as a reliable measure for establishing linguistic level in deviant children, since it can be easily used by linguistically unsophisticated persons. An adaptation of Chomsky's (1965) transformational grammar by Rosenbaum (1967) was modified (Ingram, 1970) for writing grammars for each child. The two groups representing five linguistic levels were compared according to 1) phrase structure rules; 2) transformations; 3) construction types or surface realization of major syntactic categories and their relations; 4) inflectional morphology; and 5) select lexical items representing minor syntactic categories.

The five linguistic categories were chosen because they reflect a broad assessment of base syntactic development. Phrase structure and transformational analysis presumably characterizes some important aspects of the child's knowledge or competence about the organization and interpretation of sentences. From the characterization of the child's competence or grammars, certain criterion measures were developed for comparing type and occurrence of phrase structures and transformations. In addition, construction types, inflectional morphology, and minor lexical items were selected to represent important aspects of the realization of the child's knowledge of sentences; i.e., performance. The five categories, when paired with linguistic level, provide excellent data for developing language programs for the linguistically deviant child.

METHOD

2.0 Subjects. Fifteen young normal subjects representing the age period when normal children acquire a base syntactic system were selected from the Stanford community and Bing nursery school at Stanford University. The normal children were matched, using mean number of morphemes per utterance as the criterion, with fifteen linguistically deviant children currently seen at the Institute for Childhood Aphasia, Stanford University School of Medicine. The two groups were divided into five linguistic levels of development with three subjects at each level. The age range for the normal group was 1.7-3.1 (one year, seven months-three years, one month) with a mean age of two years, four months. The deviant group had an age range of 3.8-9.6 (three years, six months-nine years, six months) with a mean age of six years, seven months (Table I). The normal group was screened for speech and hearing pathologies. The linguistically deviant group was restricted to children who lack sufficient intellectual or physiological impairment to account for their difficulties in acquiring language.

2.1 Language Samples. The language samples were collected under three conditions: 1) free play with the experimenter or parent, 2) elicitation while playing with toys, and 3) elicitation while viewing a standard children's book. It was generally possible to collect samples under all three conditions, except for the younger normal children and the lower level deviant children. In cases where it was not possible to collect samples under all three conditions, samples were collected only under the first two conditions.

A high fidelity tape recorder was used to record the linguistic interaction between the adult and the child. In addition, an observer recorded the initial adult utterance, if any, the child's utterance, and the adult expansion of that utterance. In this way, the child's intended grammatical relations were more closely approximated than by tape recordings or by observations alone. The utterances were then transcribed from the tapes and compared with the observer's records for a final decision.

The mean number of utterances for the normal group was 175.5, while the mean number of utterances for the deviant group was 148.7 (Table I). One-word utterances were not included in the samples of either group in order that each utterance would involve base syntactic relations. In addition, each linguistic structure had to occur four times or more and be present at all successive linguistic levels to be considered a part of the child's productive system (Bloom, 1970). Grammars were written for each language sample, using a modified version of Rosenbaum's (1967) grammar. Rosenbaum's system was selected because it incorporates many of the recent advances on Chomsky's (1965) transformational grammar.

RESULTS

3.0 The phrase structure grammars necessary to account for the utterances of the normal and deviant groups were nearly identical for each of the five linguistic levels. Minor differences did appear in the grammars for the two groups at the five levels but these differences were no greater than the differences between subjects within the same group at a given level.

The two groups also did not differ significantly in the proportion of utterances reflecting only phrase structure relations across the five linguistic levels. However, the proportion of phrase structure or zero-transformation utterances decreased with linguistic level for the normal and the deviant group. Nearly half the utterances at level II were without transformations while less than ten percent of the utterances were without transformations at level III. This rather dramatic change in phrase-structure-transformations ratio between level II and III held for both groups. Despite these similarities when chronological age rather than linguistic level was considered, the deviant group showed a marked delay as compared to normals in both onset and acquisition time. The delay for the beginning of level I functioning was three and one-half years while the acquisition period for reaching level V was delayed two years, five months. This delay in onset and acquisition time also held for transformations, construction types, inflections and minor lexical categories. It appears that deviant children take on the average three times as long to initiate and acquire base syntax.

Forty different transformations were identified in the language samples of both groups. The transformations of each group were assigned absolute ranks based on their frequency of occurrence. A Spearman rank order correlation was significant ($r = .96$, $t = 21.30$, $p < .01$) indicating a high degree of similarity between the two groups (Figure I). In addition, the forty transformations were compared individually for the two groups using the Mann-Whitney U Test (Siegel, 1956). Four of the forty transformations showed significantly greater occurrence for the normal group (question "do" segment, locative, demonstrative, noun deletion) while two showed significantly greater occurrence for the deviant group (progressive affix, plural affix).

To determine any differences between the two groups on infrequently occurring transformations, the forty transformations were divided into twenty frequently occurring transformations and twenty infrequently

occurring transformations. A sign test revealed no significant difference for the frequent transformations ($p. < .41$) while the infrequent transformations revealed a significant difference ($p. < .06$), (Siegel, 1956). This finding suggests that while no overall significance exists between the two groups on frequency of occurrence of transformation types, the less frequent transformations, and presumably more difficult as a group, were used significantly less by the deviant group (Figure II).

An additional check was made to determine if more specific differential use of the transformations could be found between the two groups. The forty transformations were divided into four general categories: 1) sentence transformations, 2) noun transformations, 3) verb transformations, and 4) question transformations. Significant linguistic level effects were found for sentence transformations ($F = 8.70$, $df = 4/20$, $p. < .01$), noun transformations ($F = 48.62$, $df = 4/20$, $p. < .01$), and question transformations ($F = 5.32$, $df = 4/20$, $p. < .01$). However, significant group differences were only found for question transformations ($F = 10.50$, $df = 4/20$, $p. < .05$). In addition, a significant interaction was found between linguistic level and the two groups ($F = 2.98$, $df = 4/20$, $p. < .05$) as a result of the deviant group having more question transformations at level I; namely, signaling questions by intonation. The normal group had significantly more question transformations at the four remaining linguistic levels (Figure III).

Finally, the mean number of transformations used per utterance was compared across the five linguistic levels for the two groups. No significant group differences were found. However, a significant level effect was found ($F = 66.12$, $df = 4/20$, $p. < .001$) and the differences were significant for both groups across all five levels (Figure IV). When the mean number of transformations per utterance were correlated with age, the normal group had a high positive correlation ($r = .905$, $p. < .01$) while the deviant group did not ($r = .161$). Again, a major finding is the marked delay in onset time and acquisition period for acquiring transformations.

The construction types depict major lexical categories (i.e., noun, verb, etc.) and their syntactic frames or possible relations. Two measures were derived from the construction types and compared for the two groups. The mean number of major lexical categories per construction type was used to determine the occurrence of major categories in a variety of contexts for language samples of both groups. Significant differences were obtained between the two groups ($F = 5.51$, $df = 1/20$, $p. < .05$) and across linguistic levels ($F = 23.81$, $df = 4/20$, $p. < .01$), (Figure V). In addition, each syntactic relation or construction type was compared for the two groups on the basis of frequency of occurrence. A low positive correlation was found when the construction types were compared across the two groups ($r = .435$). When age was correlated with mean number of lexical categories per construction type, the normals showed a high correlation with age ($r = .762$, $p. < .01$) while the deviant group showed a low

correlation with age (r = .136). The deviant group again manifested the marked delay in onset and acquisition time.

To determine the relative increase in the occurrence of inflections, such as plurals, past tense, possessives, etc., across the five linguistic levels, word-morpheme ratio's were computed for the two groups. Utterances either had one inflection (i.e., two words, three morphemes) or two inflections (i.e., five words, seven morphemes). The findings were not significant for the two groups, although a significant level effect was found ($F = 71.81$, $df = 4/20$, $p. < .01$). The deviant group did, however, have more inflections at the first three linguistic levels than did the normal group (Figure VI).

Select lexical items that represent minor lexical categories were also compared for the two groups. The lexical items used for comparison were pronouns, demonstratives, wh forms, prepositions, and modals. The primary concern in this comparison was to determine at what level and in what order the various items appeared for the two groups. With the exception of pronouns, only minor variance was found in the level or order of appearance of the lexical items. The deviant group by level III had sixteen pronouns while the normal group had nine pronouns (Table II).

DISCUSSION

4.0 Clearly, the major differences between normal and linguistically deviant children of comparable linguistic level were not in the organization or occurrence of specific subcomponents of their base syntactic systems. Rather, the significant differences were found in the onset and acquisition time necessary for learning base syntax and the utilization of an aspect of that system, once acquired, for producing major lexical items in a variety of utterances.

Phrase structure development showed similar rule systems as well as similar occurrences of zero-transformation (phrase structure) utterances for both groups across five distinct levels of linguistic development. No overall differences were found in the frequency or type of transformational rules produced in the language samples of the two groups. Of the forty transformations compared, only six transformations were significantly different in their frequency of occurrence. Four occurred more frequently in the normal group while two occurred more frequently in the deviant group. Moreover, the mean number of transformations used by the two groups across the five levels were not significantly different indicating no severe limitation in the deviant group in the number of transformations used in a particular utterance.

The two groups were also compared on frequently occurring and infrequently occurring transformations and four general categories of transformations. Significant differences were found between the two groups on infrequently occurring transformations and the general category of questions. The findings for differences in infrequently occurring transformations are similar to those of Menyuk (1964). Of

the twenty-eight transformations compared, she found that sixteen were used less often by the deviant group. However, only one of the sixteen transformations was used significantly less often by the deviant group. The relative absence of questions in the language samples of the deviant group probably reflects either a general sampling problem inherent to children with productive liabilities or a general socio-linguistic posture which is antithetical to seeking information by linguistic code. It would be difficult to assume that question transformations are psychologically more difficult than many of the transformations acquired by the deviant group.

The development of inflections and minor lexical items (pronouns, demonstratives, wh forms, prepositions, and modals) was also compared in the two groups. In the case of minor lexical items only minor variance was found in the level or the order of appearance of these items, save pronouns. The deviant group at level III had sixteen pronouns as compared to nine for the normal group at the same level. The amount of time the deviant group spends between levels II and III seems to allow them to make more distinctions between self and others and for those distinctions to be linguistically marked.

There were no significant differences in the development of inflections as determined by word-morpheme ratio. The deviant group, however, did have more inflections at the first three levels of linguistic development than did the normal group. This difference was also reflected in the comparison of transformation types where both the progressive and plural affix were used significantly more often by the deviant group. These differences may reflect both the increased time the deviant group spends at each linguistic level and the fact that since inflections are not introduced by major transformations, they are easily detected in the surface structure. Where cognitive distinctions, such as number, are easily marked linguistically, as in the case of plural forms, deviant children appear to be somewhat less delayed in acquiring these forms.

Though few differences were found in phrase structure or transformational development, save infrequently occurring transformations and questions, including the mean number of transformations used per utterance, significant differences were found in the number of major lexical categories per construction type. Since the two groups were matched on essentially mean number of major lexical categories per utterance, the finding suggests a restriction in the variety of construction types produced by the deviant group. This finding is further supported by the low correlation found when types of constructions were compared between the two groups. Transformations also affect the variety of construction types produced and a significant difference was found on the infrequently occurring transformations.

These results suggest that deviant children, when studied at their particular level of linguistic development, are not seriously deficient in the organization of phrase structure rules, types of transformations, or the mean number of transformations used in a given utterance. However, deviant children appear to be significantly restricted in their ability

to develop and select grammatical and semantic features which allow existent and new major lexical categories to be assigned to larger sets of relational contexts.

In Chomsky's (1965) system, the base component of transformational grammar is composed of a categorical component and a lexicon. The categorical component handles general properties of the deep structure, such as defining grammatical relations and determining base syntactic order. The lexicon handles less general properties, including 1) properties relevant to the function of transformational rules, 2) information regarding the varied placement of lexical items in a sentence, and 3) properties relevant to semantic interpretation. Thus, grammatical relations and order are determined by the categorical component, while contextual restrictions are determined by the lexicon.

The deviant group manifested grammatical relations and base syntactic order not unlike that of the normal group. The finding of similar phrase structure rules indicates that the two groups were not different in their base organization of the categorical component. However, the finding of difference on major lexical categories per construction type and a low correlation on types of constructions indicates that the deviant group was restricted in their ability to handle less general properties specified by the lexicon. Specifically, this would involve the function of transformational rules as indicated by the difference found for infrequently occurring transformations and information regarding varied placement of lexical items in a sentence, the latter difference reflected in their restricted use of major lexical categories per construction type and the low correlation on types of constructions. The delay in both onset and acquisition time for base syntax is, no doubt, closely related to the deviant group's ability to assign an adequate semantic interpretation to an utterance in comprehension as well as production. The properties of the lexicon are also closely related to the well-formedness of an utterance. Our observations of the language samples and those of Menyuk (1969) suggest that the utterances produced by deviant children are on the whole less well-formed than those of normal children. Finally, since semantic interpretation is closely related to cognitive functioning, this raises the question of whether the problem is purely linguistic.

Other research has indicated that the language learning difficulties of deviant children may not be entirely the result of a linguistic deficit. For example, Inhelder (1966) and Ajuriaguerra (1966) have found, using Piagetian-type tasks, that children with severe language delay show a specific deficit in symbolic imagery. In Piaget's cognitive-developmental theory, the child develops a general capacity of representation and language represents only one manifestation of this representation (1970). It is interesting to note in this regard that Lovell, Hoyle and Siddal (1968) found that children with language delay are also delayed in symbolic play as compared to normals. It seems reasonable to conclude, then, that linguistically deviant children probably reflect a specific cognitive dysfunction, particularly a dysfunction in all phases of symbolic representation. Moreover, perceptual deficiencies have also been found in children with language

delay for both the auditory and visual modalities (Rosenthal and Eisenson, 1970; Mackworth, Grandstaff and Pribram, in press). Thus, the notion of a specific cognitive deficit becomes more tenable than a specific linguistic deficit in view of perceptual deficiencies that are modality non-specific and the serious delay in onset and acquisition times for base syntax.

There seem to be other restrictions in the performance capacities of linguistically deviant children aside from those found in this study. For example, Menyuk (1969) and Lovell, et al (1968) in testing an aspect of linguistic processing have found that children with language delay generally construct sentences simpler than those of normal children when imitating model sentences in an elicited imitation task. Fraser, Brown and Bellugi (1963) found that normal children typically imitate utterances before they can comprehend or produce them. Recently, Lovell, et al (1968) have found that children with language delay comprehend sentences before they imitate or produce them. Their finding of no significant difference on the comprehension task suggests that their normal and deviant groups were at a similar linguistic level of development and that the deviant group showed a productive deficiency similar to the deficiency found for our group. That is, similar comprehension scores indicate that the underlying linguistic systems were comparable for the two groups although their imitative and productive capacities were not.

Another indication of a deficiency in productive capabilities is the relative absence of question transformations. Since it is unlikely that question transformations are psychologically more difficult than other transformations acquired by the deviant group, their relative absence may indicate atypical or delayed socio-linguistic development. Brown (1970) has suggested for young normal children, at least, that a significant part of their "telegraphic style" may be due to the slower development of language usage or discourse rules. Linguistically deviant children frequently manifest atypical social development and any complete account of their productive deficiencies must consider the development of discourse rules.

TABLE I. Mean age, sample size, and morpheme per utterance length for the normal and deviant groups at each of the five linguistic levels.

Linguistic Level	Normal Age	Normal Sample Size	Normal MM/U	Deviant Age	Deviant Sample Size	Deviant MM/U
I	20.0	76.7	2.23	62.3	79.7	2.33
II	21.0	109.7	2.72	71.3	155.3	2.83
III	33.0	223.3	3.70	70.0	161.0	3.80
IV	34.3	242.7	4.67	88.0	200.0	4.53
V	33.7	234.0	5.61	104.6	147.7	5.83

TABLE II. Linguistic level and order of appearance of minor lexical categories for the normal group.

Linguistic Category Level	Normal I	II	III	IV	V
Pronouns	I	my	you	we	her
		it	your	he	its
		it	she	they	her
		me	them	us	our
				you	
				him	
				his	
Demonstratives	that	this	these	those	
Wh forms		where	what	why	when
Prepositions		in	to	up	down
		on	with	at	of
				for	off
					like
					through
					over
					by
					under
					near
Modals	want		gonna	can	won't
			hafta	will	don't
				could	can't
				shall	gotta
					would
					may
					might
					should
					better

TABLE II. Linguistic level and order of appearance of minor lexical categories for the deviant group.

Linguistic Category Level	Deviant I	II	III	IV	V
Pronouns	it I my me	him	you it he them they she we you us your his	her their	its our her
Demonstratives	that	these	this	those	
Wh forms		what		where why	how when who
Prepositions	in		on at to down	with like	up of off out of for over by after into about except
Modals			gonna	can't can want	don't won't gotta would hadda will could didn't hafta

LEGENDS FOR FIGURES 1 - 6

Figure 1 - The average rank of the forty transformations and their frequency of occurrence for the normal and deviant groups.

Figure 2 - The average rank of the infrequently occurring transformations and their frequency of occurrence for the normal and deviant groups.

Figure 3 - The mean number of question transformations per corpus plotted across five linguistic levels for the normal and deviant groups.

Figure 4 - The mean number of transformations per utterance plotted across five linguistic levels for the normal and deviant groups.

Figure 5 - The mean number of lexical categories per construction type plotted across five linguistic levels for the normal and deviant groups.

Figure 6 - The mean number of inflections plotted across five linguistic levels for normal and deviant groups.

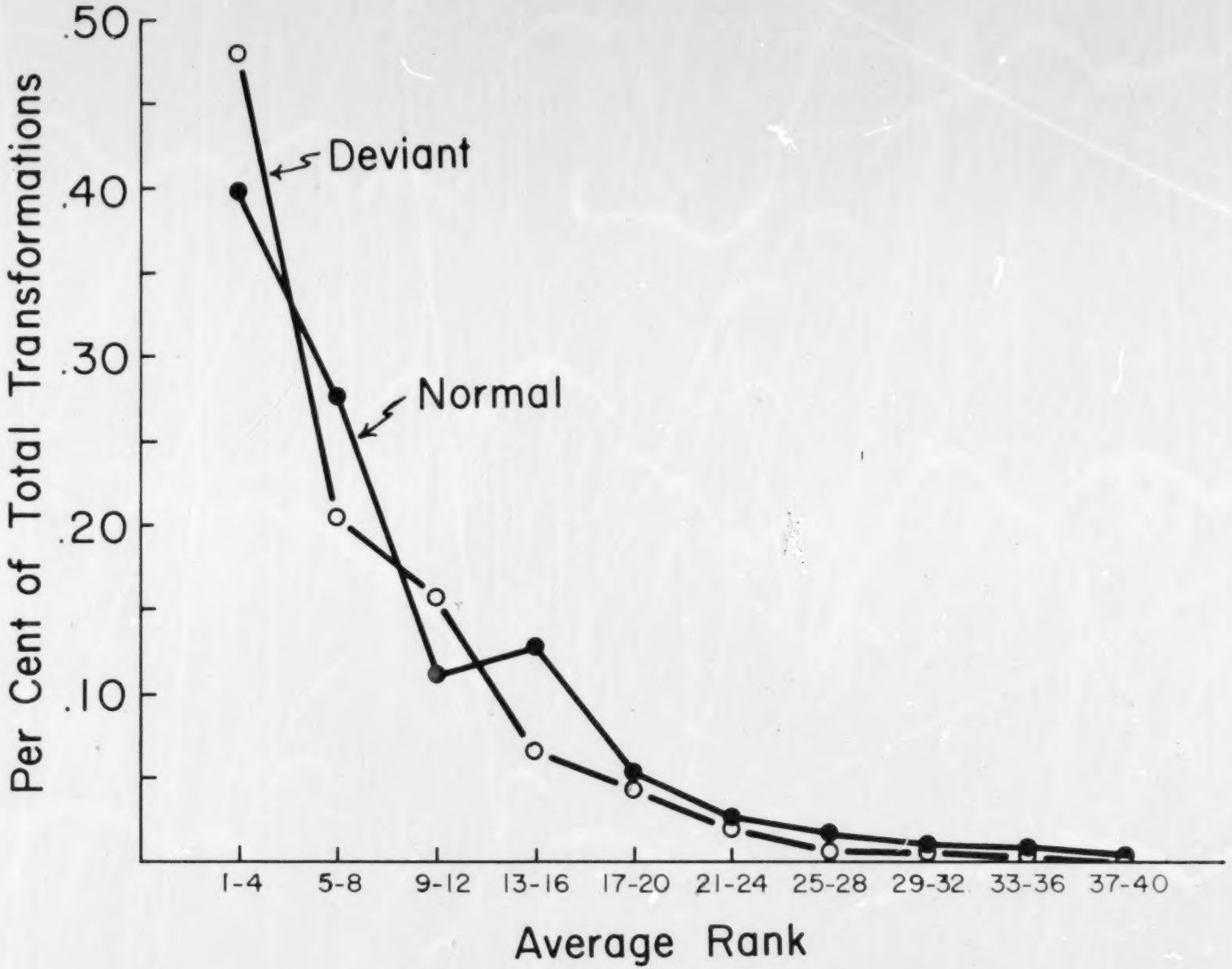
.50
.40
.30
.20
.10
Per Cent of Total Transformations
Deviant
Normal
1-4
5-8
9-12
13-16
17-20
21-24
25-28
29-32
33-36
37-40
Average Rank

Figure 1

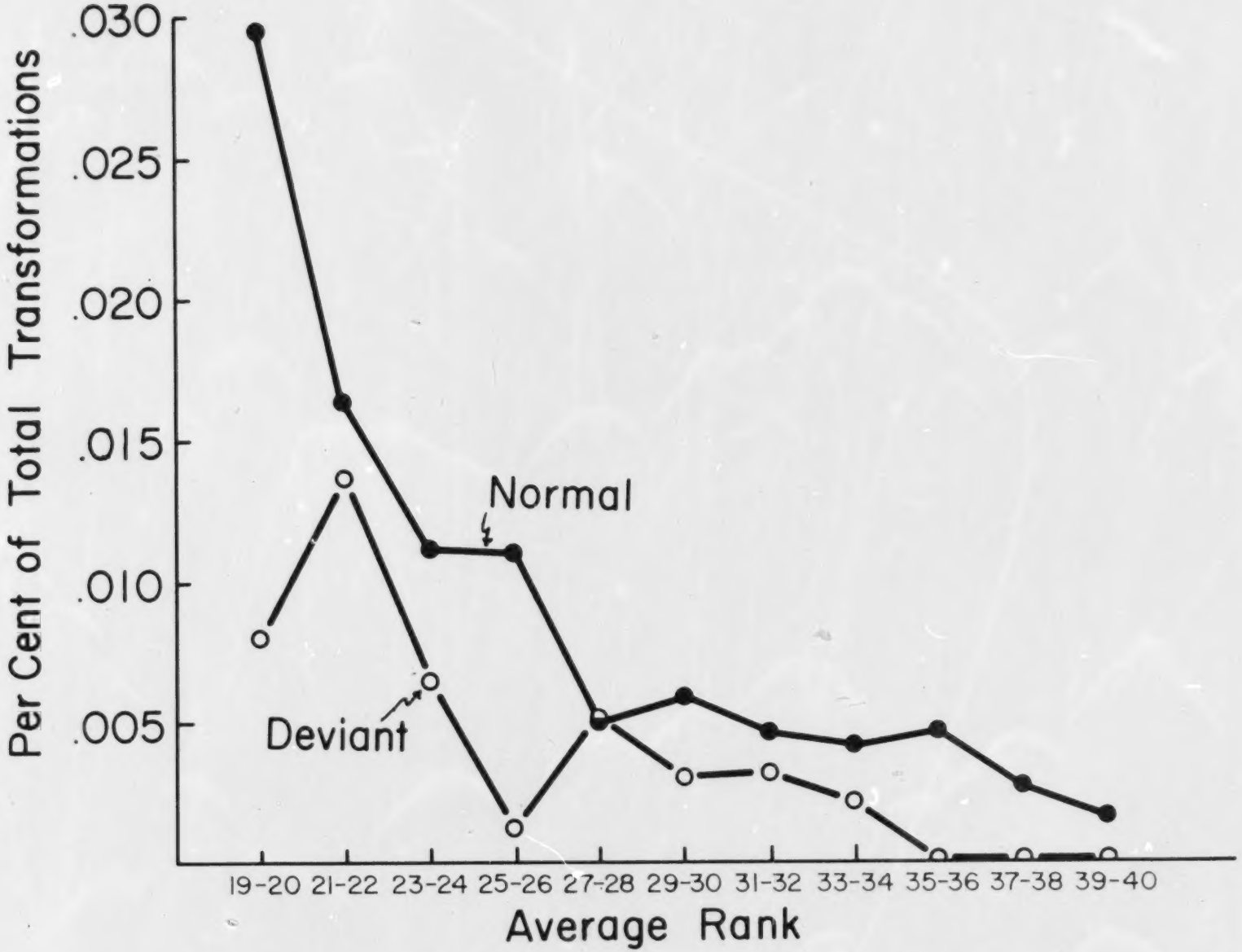
Per Cent of Total Transformations
.030
.025
.020
.015
.010
.005
Normal
Deviant
19-20 21-22 23-24 25-26 27-28 29-30 31-32 33-34 35-36 37-38 39-40
Average Rank

Figure 2

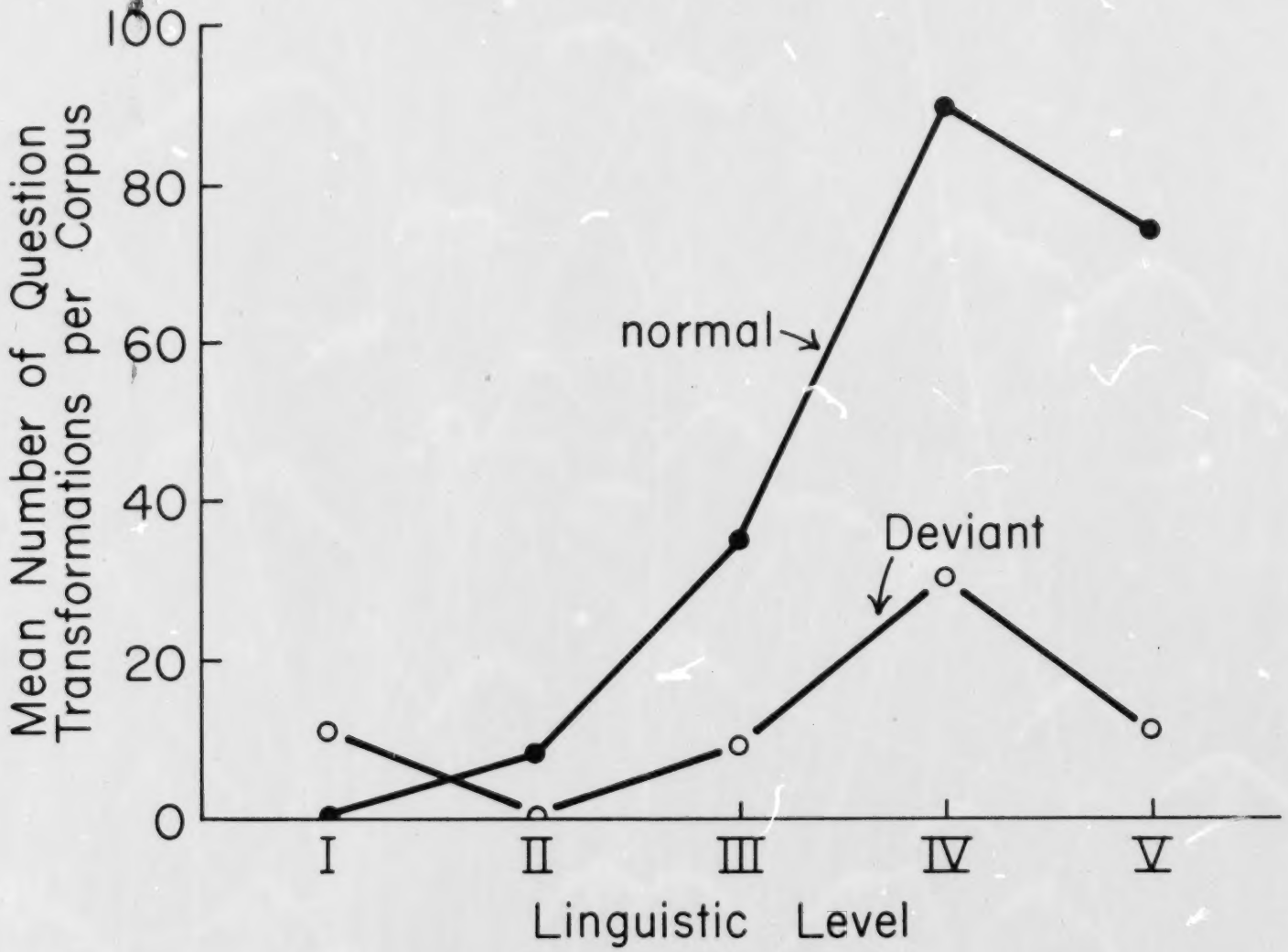
Mean Number of Question Transformations per Corpus
100
80
60
40
20
0
normal
Deviant
I
II
III
IV
V
Linguistic Level

Figure 3

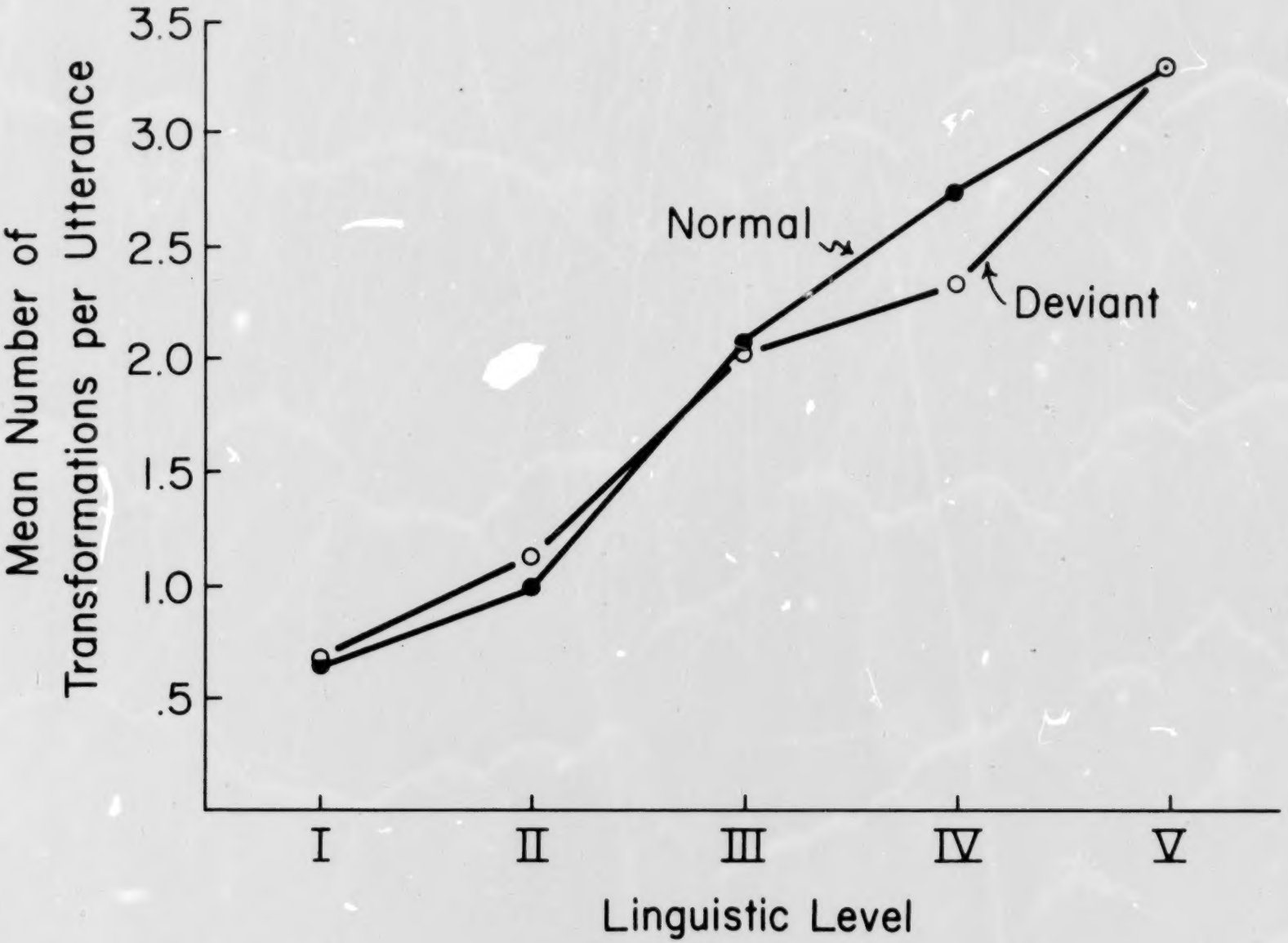
Mean Number of Transformations per Utterance
3.5
3.0
2.5
2.0
1.5
1.0
.5
Normal
Deviant
I
II
III
IV
V
Linguistic Level

Figure 4

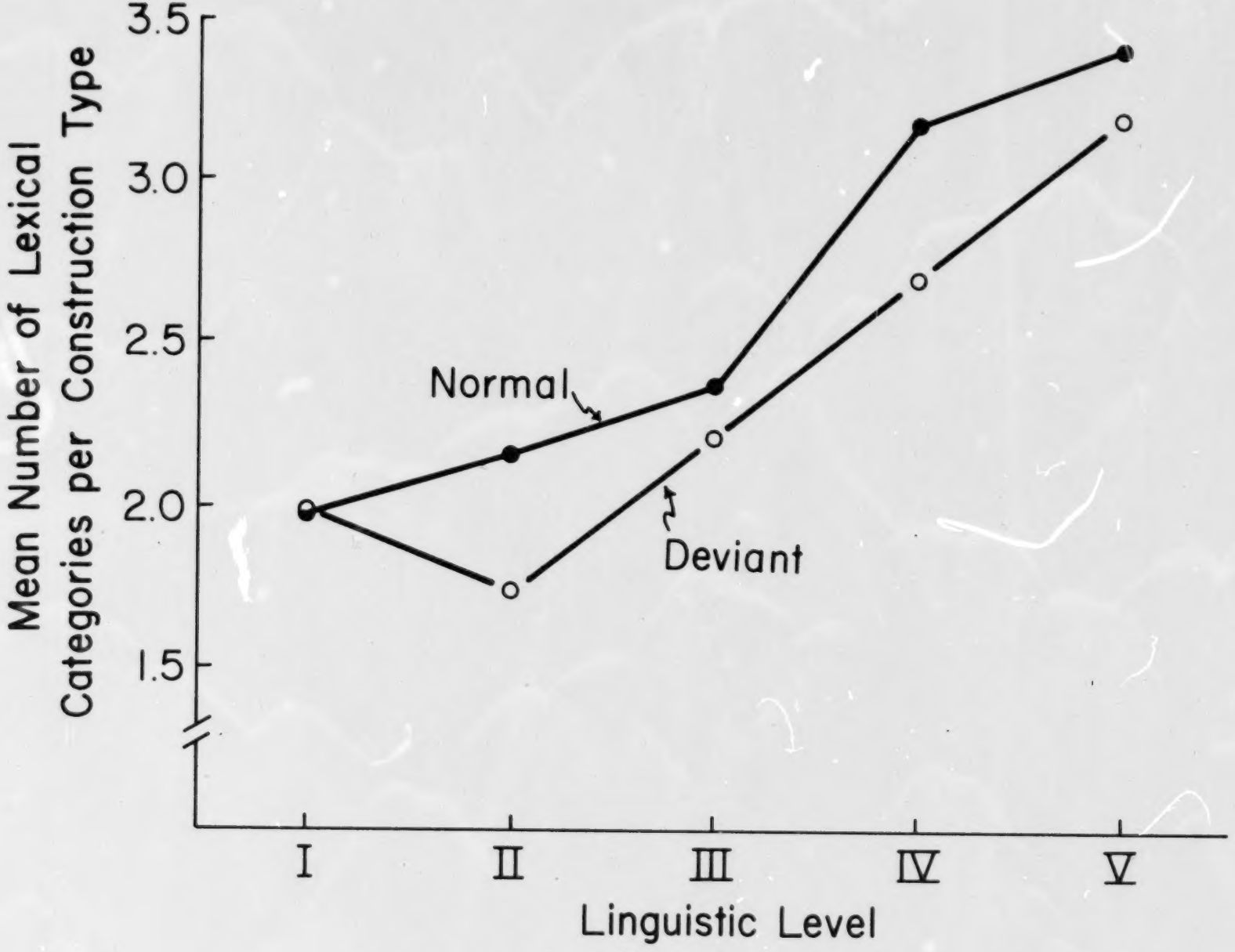
Mean Number of Lexical Categories per Construction Type
3.5
3.0
2.5
2.0
1.5
Normal
Deviant
I
II
III
IV
V
Linguistic Level

Figure 5

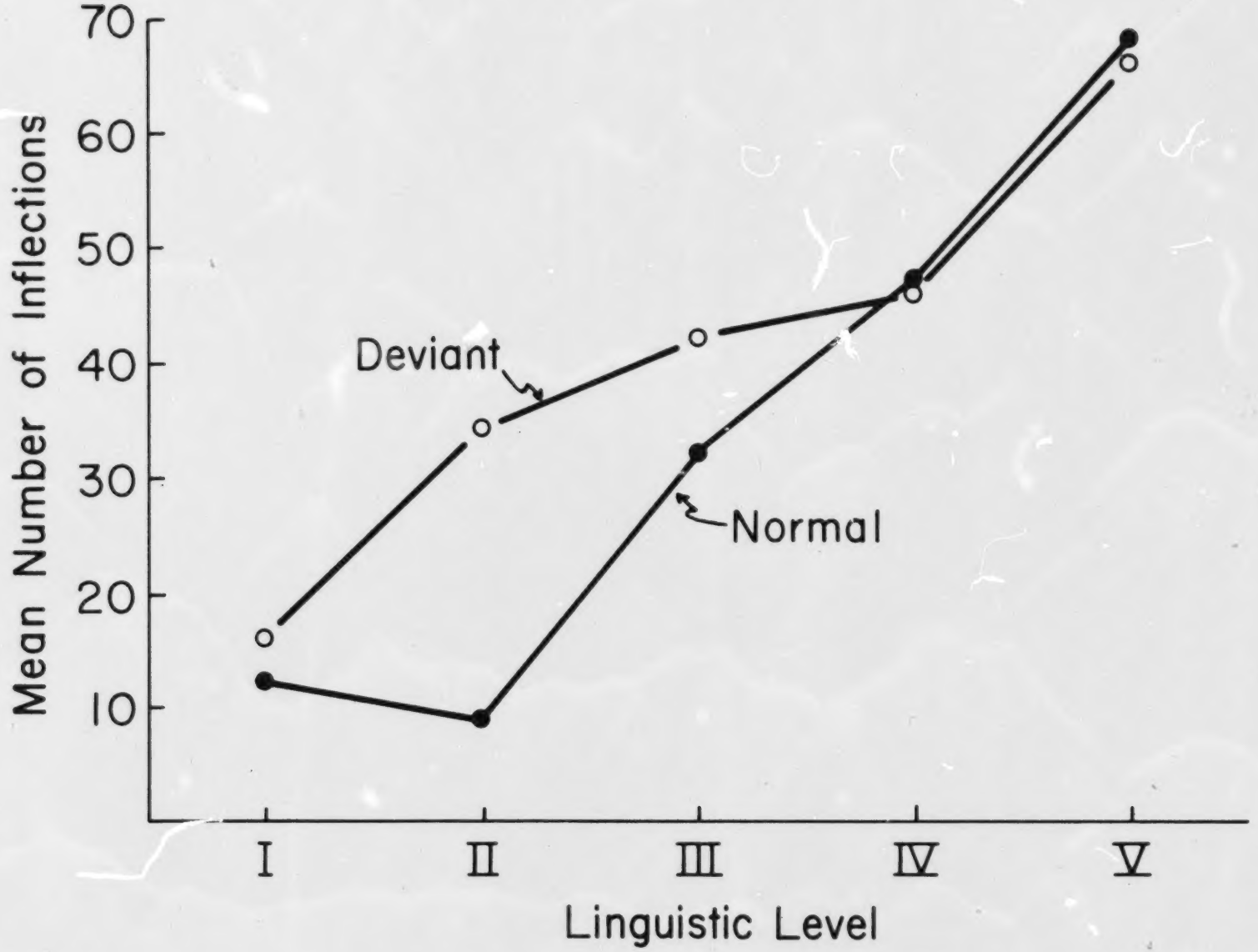
70
60
50
40
30
20
10
Mean Number of Inflections
Deviant
Normal
I
II
III
IV
V
Linguistic Level

Figure 6

REFERENCES

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